

Attorney Docket No: ARC 3116 R1

## I. AMENDMENTS

### Amendments to the Claims:

This listing of claims will replace all prior versions and listings of claims in the application.

### Listing of Claims:

Claim 1. (Canceled)

Claim 2. (Currently amended) A method of coating a liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the liquid onto the substrate, comprising the steps of:

providing an agent-containing coating liquid;

providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;

conveying said coating liquid onto said liquid-holding surface;

controlling the depth of said coating liquid at said coating transfer region to a predetermined depth; and

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region, wherein the microprojections have a length, as measured from a surface or edge of the substrate, which is greater than said predetermined depth of said coating liquid at said coating transfer region.

Claim 3. (Currently amended) A method of coating a liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the liquid onto the substrate, comprising the steps of:

providing an agent-containing coating liquid;

providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;

conveying said coating liquid onto said liquid-holding surface;

controlling the depth of said coating liquid at said coating transfer region to a predetermined depth; and

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region, wherein the microprojections have a length, as measured from a surface or edge of the substrate, which is greater than said predetermined depth, and wherein the

Attorney Docket No: ARC 3116 R1

depth of said coating liquid at said coating transfer region is greater than said microprojection immersion level.

Claim 4. (Previously amended) A method of coating a liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the liquid onto the substrate, comprising the steps of:

- providing an agent-containing coating liquid;
- providing a cylindrically shaped roller having a liquid holding surface, said liquid-holding surface having a coating transfer region;
- conveying said coating liquid onto said liquid-holding surface;
- controlling the depth of said coating liquid at said coating transfer region to a predetermined depth; and

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region.

Claim 5. (Previously amended) A method of coating a liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the liquid onto the substrate, comprising the steps of:

- providing an agent-containing coating liquid;
- providing a cylindrically shaped roller having a liquid holding surface, said liquid-holding surface having a coating transfer region;
- conveying said coating liquid onto said liquid-holding surface by rotating a portion of said roller through a bath of said coating liquid;
- controlling the depth of the coating liquid at the coating transfer region to a predetermined depth; and

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region.

Claim 6. (Previously amended) A method of coating a liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the liquid onto the substrate, comprising the steps of:

- providing an agent-containing coating liquid;
- providing a cylindrically shaped roller having a liquid holding surface, said liquid-holding surface having a coating transfer region;

Attorney Docket No: ARC 3116 R1

conveying said coating liquid onto said liquid-holding surface by rotating a portion of said roller through a bath of said coating liquid;

controlling the depth of said coating liquid at said coating transfer region to a predetermined depth by controlling the rotational speed of said roller; and

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region.

Claim 7. (Previously amended) A method of coating a liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the liquid onto the substrate, comprising the steps of:

providing an agent-containing coating liquid;

providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;

conveying said coating liquid onto said liquid-holding surface;

controlling the depth of said coating liquid at said coating transfer region to a predetermined depth; and

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region, wherein said step of immersing of the microprojections is accomplished by conveying the substrate along a predetermined pathway adjacent said coating transfer region.

Claim 8. (Currently amended) A method of coating a liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the liquid onto the substrate, comprising the steps of:

providing an agent-containing coating liquid;

providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;

conveying said coating liquid onto said liquid-holding surface;

controlling the depth of said coating liquid at said coating transfer region to a predetermined depth; and

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region, wherein said step of immersing of the microprojections is

Attorney Docket No: ARC 3116 R1

accomplished by continuously conveying a web comprised of a plurality of the substrates along a predetermined pathway adjacent said coating transfer region.

Claim 9. (Previously amended) A method of forming a solid coating on a plurality of microprojections extending from a surface or edge of a substrate without forming a coating on the substrate, comprising the steps of;

- providing an agent-containing coating liquid;
- providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;
- conveying said coating liquid onto said liquid-holding surface;
- controlling the depth of said coating liquid at said coating transfer region to a predetermined depth;
- immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region;
- removing the microprojections from said coating liquid; and
- drying the coating liquid coated on the microprojections thereby forming a solid agent-containing coating on the microprojections.

Claim 10. (Currently amended) A method of forming a solid coating on a plurality of microprojections extending from a surface or edge of a substrate without forming a coating on the substrate, comprising the steps of:

- providing an agent-containing coating liquid;
- providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;
- conveying said coating liquid onto said liquid-holding surface;
- controlling the depth of said coating liquid at said coating transfer region to a predetermined depth;
- immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region;
- removing the microprojections from said coating liquid; and
- drying the coating liquid coated on the microprojections thereby forming a solid agent-containing coating on the microprojections; and

Attorney Docket No: ARC 3116 R1

repeating said immersing, removing and drying steps to provide multiple layers of said solid agent-containing coating.

**Claim 11. (Currently amended)** A method of forming a solid coating on a plurality of microprojections extending from a surface or edge of a substrate without forming a coating on the substrate, comprising the steps of:

providing an agent-containing coating liquid;

providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;

conveying said coating liquid onto said liquid-holding surface;

controlling the depth of said coating liquid at said coating transfer region to a predetermined depth;

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region;

removing the microprojections from said coating liquid; and

drying the coating liquid coated on the microprojections thereby forming a solid agent-containing coating on the microprojections, wherein said agent comprises a drug or a vaccine and the liquid comprises water.

**Claim 12. (Currently amended)** A method of forming a solid coating on a plurality of microprojections extending from a surface or edge of a substrate without forming a coating on the substrate, comprising the steps of:

providing an agent-containing coating liquid;

providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;

conveying said coating liquid onto said liquid-holding surface;

controlling the depth of said coating liquid at said coating transfer region to a predetermined depth;

immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region;

removing the microprojections from said coating liquid; and

drying the coating liquid coated on the microprojections thereby forming a solid agent-containing coating on the microprojections, wherein said coating liquid comprises a liquid

Attorney Docket No: ARC 3116 R1

solvent and said agent, wherein said coating liquid has an agent concentration, and wherein said agent concentration is controlled by a method selected from the group consisting of conducting said coating at a temperature which reduces evaporative loss of said liquid solvent, conducting said coating in an atmosphere containing sufficiently high amounts of gaseous solvent to reduce evaporative loss of said liquid solvent, infusing liquid solvent into said coating liquid at a rate which compensates for evaporative loss of said liquid solvent, and combinations thereof.

Claim 13. (Currently amended) A method of forming a solid coating on a plurality of microprojections extending from a surface or edge of a substrate without forming a coating on the substrate, comprising the steps of:

- providing an agent-containing coating liquid;

- providing a ~~rotatable member~~ cylindrically shaped roller having a liquid-holding surface, the liquid holding surface having a coating transfer region;

- conveying said coating liquid onto said liquid-holding surface;

- controlling the depth of said coating liquid at said coating transfer region to a predetermined depth;

- immersing the microprojections to a predetermined level in said coating liquid disposed at said coating transfer region;

- removing the microprojections from said coating liquid; and

- drying the coating liquid coated on the microprojections thereby forming a solid agent-containing coating on the microprojections, wherein said coating liquid comprises a liquid solvent and said agent, wherein said coating liquid has an agent concentration, and wherein said agent concentration is controlled by a method selected from the group consisting of conducting said coating at a temperature which reduces evaporative loss of said liquid solvent, conducting said coating in an atmosphere containing sufficiently high amounts of gaseous solvent to reduce evaporative loss of said liquid solvent, infusing liquid solvent into said coating liquid at a rate which compensates for evaporative loss of said liquid solvent, and combinations thereof, and

- wherein said liquid solvent comprises water, wherein said temperature is less than about 10°C, and wherein said atmosphere has a relative humidity greater than about 60%.

Attorney Docket No: ARC 3116 R1

**Claim 14. (Withdrawn)** An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating liquid at the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region.

**Claim 15. (Withdrawn)** An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a curved liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region.

**Claim 16. (Withdrawn)** An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region, the liquid holding surface being an outer surface of a rotatable cylindrically-shaped roller;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region.

Attorney Docket No: ARC 3116 R1

**Claim 17. (Withdrawn)** An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region, the liquid holding surface being an outer surface of a rotatable cylindrically-shaped roller;

- a coating liquid conveyor for providing the coating liquid at the coating transfer region;

- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and

- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid conveyor comprises rotating the roller through a bath of said coating liquid.

**Claim 18. (Withdrawn)** An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region, the liquid holding surface being an outer surface of a rotatable cylindrically-shaped roller;

- a coating liquid conveyor for providing the coating liquid at the coating transfer region;

- a coating liquid depth controller comprising a doctor blade for controlling the depth of the coating at the coating transfer region to a predetermined depth; and

- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid conveyor comprises rotating the roller through a bath of said coating liquid.

**Claim 19. (Withdrawn)** An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region;

- a coating liquid conveyor for providing the coating liquid at the coating transfer region;

- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and

- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the liquid holding



Attorney Docket No: ARC 3116 R1

surface is an outer surface of a rotatable cylindrically-shaped roller, wherein the coating liquid conveyor comprises rotating the roller through a bath of said coating liquid, wherein the coating liquid depth controller comprises a second roller, substantially parallel with the liquid holding surface roller and spaced a predetermined distance therefrom and forming a nip therebetween.

Claim 20. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region, the liquid holding surface being an outer surface of a rotatable cylindrically-shaped roller;

- a coating liquid conveyor for providing the coating liquid at the coating transfer region;

- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and

- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid conveyor comprises rotating the roller through a bath of said coating liquid, wherein the coating liquid depth controller comprises a second roller, substantially parallel with the liquid holding surface roller and spaced a predetermined distance therefrom and forming a nip therebetween, and wherein the two rollers rotate in the same rotational direction.

Claim 21. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region;

- a coating liquid conveyor for providing the coating liquid at the coating transfer region;

- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth;

- and a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the liquid holding surface is an outer surface of a rotatable cylindrically-shaped roller, wherein the coating liquid conveyor comprises rotating the roller through a bath of said coating liquid, wherein the coating liquid depth controller comprises a second roller, substantially parallel with the liquid holding

Attorney Docket No: ARC 3116 R1

surface roller and spaced a predetermined distance therefrom and forming a nip therebetween, including a doctor blade wiping the surface of the second roller upstream of the nip.

Claim 22. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- an immobile liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region.

Claim 23. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- an immobile liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid conveyor causes the coating liquid to flow, by force of gravity, over the immobile liquid holding surface.

Claim 24. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- an immobile liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid

Attorney Docket No: ARC 3116 R1

conveyor causes the coating liquid to flow, by force of gravity, over the immobile coating surface, and the immobile liquid holding surface, in the coating transfer region, is substantially planar.

Claim 25. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- an immobile liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid conveyor causes the coating liquid to flow, by force of gravity, over the immobile coating surface, and the immobile liquid holding surface, in the coating transfer region, is curved.

Claim 26. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- an immobile cylindrically-shaped liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid conveyor causes the coating liquid to flow, by force of gravity, over the immobile liquid holding surface.

Claim 27. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;

Attorney Docket No: ARC 3116 R1

a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and

a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the substrate conveyor comprises a track which is adjustably positionable to a predetermined distance from the coating transfer region and a substrate holding sled which runs along the track.

Claim 28. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

a liquid holding surface having a coating transfer region;

a coating liquid conveyor for providing the coating liquid at the coating transfer region;

a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and

a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, including a continuous substrate conveyor for continuously conveying a series of said substrates and microprojections through the coating liquid.

Claim 29. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

a liquid holding surface having a coating transfer region;

a coating liquid conveyor for providing the coating liquid at the coating transfer region;

a coating liquid depth controller for controlling the depth of the coating at the coating transfer region to a predetermined depth; and

a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, including a continuous substrate conveyor for continuously conveying a series of said substrates and microprojections through the coating liquid, wherein the continuous substrate conveyor comprises a substrate supply roll and a substrate take-up roll.

Attorney Docket No: ARC 3116 R1

**Claim 30. (Withdrawn)** An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at further the coating transfer region to a predetermined depth; and
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, including a continuous substrate conveyor for continuously conveying a series of said substrates and microprojections through the coating liquid, wherein the continuous substrate conveyor comprises a substrate supply roll and a substrate take-up roll, further including a substrate guide for positioning the continuous substrate relative to the coating transfer region.

**Claim 31. (Withdrawn)** An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

- a liquid holding surface having a coating transfer region;
- a coating liquid conveyor for providing the coating liquid at the coating transfer region;
- a coating liquid depth controller for controlling the depth of the coating at further the coating transfer region to a predetermined depth;
- a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid is comprised of a liquid solvent and the agent, the coating liquid having an agent concentration; and means for controlling said agent concentration selected from the group consisting of;
  - i. a temperature controller for controlling the temperature of said coating to a level which reduces evaporative loss of said liquid solvent;
  - ii. a coating atmosphere controller for controlling levels of gaseous solvent in an atmosphere surrounding said coating which reduces evaporative loss of said liquid solvent;
  - iii. a liquid solvent infusor for infusing liquid solvent into said coating liquid at a rate which compensates for evaporative loss of said liquid solvent; and

Attorney Docket No: ARC 3116 R1

iv. combinations thereof.

Claim 32. (Withdrawn) An apparatus for coating an agent-containing liquid onto a plurality of microprojections extending from a surface or edge of a substrate substantially without coating the substrate, comprising:

a liquid holding surface having a coating transfer region;

a coating liquid conveyor for providing the coating liquid at the coating transfer region;

a coating liquid depth controller for controlling the depth of the coating at further the coating transfer region to a predetermined depth;

a substrate conveyor for conveying the microprojections at a predetermined level of immersion through the coating liquid at the coating transfer region, wherein the coating liquid is comprised of a liquid solvent and the agent, the coating liquid having an agent concentration; and

means for controlling said agent concentration selected from the group consisting of;

a temperature controller for controlling the temperature of said coating to a level which reduces evaporative loss of said liquid solvent;

a coating atmosphere controller for controlling levels of gaseous solvent in an atmosphere surrounding said coating which reduces evaporative loss of said liquid solvent;

a liquid solvent infusor for infusing liquid solvent into said coating liquid at a rate which compensates for evaporative loss of said liquid solvent; and

combinations thereof.

wherein the liquid solvent comprises water, the temperature is less than about 10° C, and the atmosphere has a relative humidity greater than about 60%.